



Australian Bureau of Statistics

1301.0 - Year Book Australia, 1973

ARCHIVED ISSUE Released at 11:30 AM (CANBERRA TIME) 25/01/1973

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SOFTWOOD PLANTATIONS

GENERAL

The term "softwood" has long been used to represent the wood of the Coniferae, of which the most important family is the Pinaceae. This family consists primarily of trees and includes such well known producers of commercial timbers as the genera **Pinus** (pines), **Picea** (spruces), **Abies** (firs) and **Pseudotsuga** (Douglas fir).

The timber of the Coniferae is, in general, relatively light, of satisfactory strength in relation to weight, straight-grained, moderately soft and easy to work, machine and nail. In contrast, hardwoods as a group, and particularly the genus *Eucalyptus*, are heavy, strong, hard, not straight-grained and not readily nailed or worked by hand. Certain other properties, especially microscopic cell structure, result in softwoods seasoning much faster and more evenly than hardwoods. Because of these properties softwood sawnwood has a greater range of uses than *Eucalypt* sawnwood. Conifers also produce the bulk of the world's pulpwood although hardwood wood chips and woodpulp are now a significant feature of world trade in forest products.

Timber resources, production and consumption

Compared with countries of the temperate regions in the northern hemisphere, the indigenous forest resources of Australia are markedly deficient in softwoods.

A Forestry and Timber Bureau estimate of the total volume of softwoods and hardwoods in the forests of Australia is set out below.

TIMBER CONTAINED IN AUSTRALIAN FORESTS AS AT 31 MARCH 1970

(Source: Forestry and Timber Bureau)

Type of timber	Volume of timber (Million m ³ true volume under bark)	Percentage of total timber
Hardwoods	974.1	92.5
Softwoods	79.1	7.5
Total	1,053.2	100.0

In contrast to the above, the estimated supply (corresponding approximately to consumption) of sawn timber for the year 1970-71 is set out in the following table.

* This section, outlining the growth and present extent of Australian softwood plantations, was prepared by the Forestry and Timber Bureau. The part dealing with Commonwealth loans to expand softwood plantations was contributed by the Department of the Treasury.

ESTIMATED SUPPLY OF SAWN TIMBER, AUSTRALIA, 1970-71

(Source: Forestry and Timber Bureau)

Type of timber	Volume ('000 m ³)	Percentage of total timber available
Hardwood timber —		65.45
Australian production	2,443	
Plus imports	302	
Less exports	21	
Total supply of hardwood timber	2,724	
Coniferous timber -		34.55
Australian production	769	
Plus imports	673	
Less exports	4	
Total supply of coniferous timber	1,438	100.00
Total supply of all timber	4,162	

The trend of Australian softwood sawn timber production during recent years is given in following table.

AUSTRALIAN SOFTWOOD SAWN TIMBER PRODUCTION, SELECTED YEARS

1955-56 TO 1971-72

(Source: Forestry and Timber Bureau)

('000 m³)

	Rain forest species	Cypress pine	Plantation grown species	Total softwood
1955-56.	91.2	173.9	382.3	647.3
1960-61.	71.6	169.1	396.4	637.1
1965-66.	53.8	148.1	586.2	788.1
1970-71	34.0	135.9	599.0	768.9
1971-72	36.8	145.8	634.3	816.9

Notable in the above table is the steady decline in the production of softwood species from the virgin rain forests of Queensland and northern New South Wales, and the striking increase in plantation grown timber. The latter is mainly *Pinus radiata*, but already includes a small amount of

plantation grown hoop pine.

In the future, rain forest production will probably stabilise at a figure approximating yearly production in 1970, whereas plantation grown timber will increase considerably as a result of the harvesting of increased planting areas established under the Softwood Forestry Agreements Acts of 1967 and 1972 (See page 882 for further reference to these Acts).

Early plantation establishment in Australia

The first steps in the creation of government plantations in Australia were taken in 1870, most appropriately, by the State which had the poorest natural resources-South Australia. Planting Commenced in 1876, and has continued without interruption ever since, though it was not until shortly before the 1914-18 war that appreciable areas were established each year. These very early plantings here and elsewhere provided valuable evidence in later years as to the suitability of various sites for *Pinus radiata* and other species. The commencement of plantings in South Australia also led to the formation of the Woods and Forests Department of that State, one of the oldest forest Services in the British Commonwealth.

Under the aegis of Lands Departments and other State organisations, small plantations were established in other States, notably Victoria, shortly after that time, although it was not until much later that independent forest services were created.

Commonwealth loans to expand softwood plantations.

Planting was continued at a steady rate between the two World Wars. After the Second World War, planting programs were re-commenced, but at a rate insufficient to provide Australia's future requirements for softwood.

In February 1965 the Australian Forestry Council recommended that the rate of expansion of softwood timber plantings in Australia should be increased from their existing level of about 40,000 acres a year to 75,000 acres a year for the next thirty-five years. The recommendations envisaged phased increase in the rate of Government plantings by the various State Governments up to a level of some 63,000 acres per annum together with plantings by the Commonwealth in the Territories of 2,000 acres per annum, and an average of at least 10,000 acres per annum by private forest owners. The Council considered that such a program would make a major contribution towards meeting Australia's future requirements for softwood products.

In February 1966 the Commonwealth Government endorsed this recommendation and agreed as a first step towards achieving the proposed annual target of 75,000 acres, to provide financial assistance to each State, over a five-year period commencing 1 July 1966, to enable them to accelerate their rate of softwood plantings. The assistance, which was provided to the States under section 96 of the Constitution, took the form of long-term loans repayable over twenty-five years with repayments of principal and the payment of interest commencing ten years after the date of each advance. The **Softwood Forestry Agreements Act** 1967 authorised the Commonwealth to enter into agreements with each of the States to provide financial assistance by way of loans during the financial years 1966-67 to 1970-71 inclusive.

In February 1969 the Australian Forestry Council recommended a continuation of Commonwealth financial assistance to the States for softwood timber planting for a further five-year period. The Commonwealth Government agreed in principle to the Australian Forestry Council's recommendations and following negotiations with the States it was agreed that the Commonwealth would assist towards a State planting program of 54,680 acres per annum. The **Softwood Forestry Agreements, Act** 1972 authorised the Commonwealth to provide financial assistance to the States, by way of loans, during the financial years 1971-72 to 1975-76 inclusive. These loan funds are to be provided on the same terms and conditions as for the first

program.

Payments under the two Acts by the Commonwealth to all States have been as follows: 1966-67, \$291,000; 1967-68, \$3,456,000; 1968-69, \$3,872,000; 1969-70, \$4,814,000, 1970-71, \$4,784,000; 1971-72, \$389,338; 1972-73 (estimated), \$9,100,000; 1973-74 (estimated), \$5,200,000. It is estimated that of the payment of \$9.1 million for 1972-73, \$4.1 million will be made available to cover expenditure incurred in 1971-72.

Relative demand for softwood and hardwood

Because of the general suitability of softwood for many purposes it seems likely that the future demand for it will trend upwards until it reaches at least sixty per cent of total consumption. It is interesting to note that in South Australia, the only State which has significant home-grown softwood supplies in relation to population, softwoods at present comprise more than eighty per cent of the total sawn timber consumption. The present figure for Australia as a whole is approximately thirty five per cent.

Forestry and land utilisation

Many species of the genus **Pinus** can grow satisfactorily on relatively poor sandy soils with a mean annual rainfall which may be less than thirty inches. Under such conditions only the poorer types of eucalypts will grow and the mean annual increment in timber is very low, whereas with the pines it may average 4.67 cubic metres of timber in the ground per acre. Since land of the above type is usually not good enough for agriculture and only of moderate value for pasture, utilisation for softwood plantations may produce the greatest benefit to the nation. The main species of introduced pines now grown in Australia will grow to maturity within forty years, whereas the better types of eucalypts require double that length of time to mature and, unless on exceptionally favourable sites, do not produce as high a mean annual increment of timber.

Adequacy of timber supplies

Since most of Australia's timber imports consist of softwoods a policy directed towards increasing self-sufficiency in timber supplies has been formulated, thus reducing foreign exchange requirements. The present target based on existing population projections is designed to achieve self-sufficiency by the year 2000. By this time a plantation resource of three million acres will be available, if the annual planting rate recommended by the Australian Forestry Council is maintained. The periodic re-examination of trends in timber usage in the future will enable the program to be modified as necessary to meet any revised targets.

Extent of existing softwood plantations

The following tables outline the growth of Australian softwood plantations to 31 March 1972.

AREA OF CONIFEROUS PLANTATIONS, BY TYPE OF PLANTATION, 31 MARCH 1972

(Source: Forestry and Timber Bureau)
(Acres net)(a)

	N.S. W	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Government-	185,871	114,012	4,883	155,883	30,132	46,767	..	28,773	566,321
Exotic	20,159	7,464	104,563	16,478	44,000	198	75	2,235	195,172
conifers-	3,131	2,552	405	..	..	322	..	369	6,779
Pinus radiata	3,044	..	80,636	..	..	..	6,524	..	90,204

Other pinus species	212,205	124,028	190,487	172,361	74,132	47,287	6,599	31,377	858,476
Other exotic conifers									
Native conifers	25,330	128,528	866	40,549	8,984	19,357	..	..	223,614
	17,100	8,976	47,429	18	548	10	50	..	74,131
Total	42,430	137,504	48,295	40,567	9,532	19,367	50	..	297,745
Private-Pinus radiata	254,635	261,532	238,782	212,928	83,664	66,654	6,649	31,377	1,156,221
Other conifers									
Total									
Grand Total									

(a) Excludes firebreaks and other areas not actually forested.

AREA OF CONIFEROUS PLANTATIONS, BY TYPE OF PLANTATION, AUSTRALIA

31 MARCH, 1968 TO 1972

(Source: Forestry and Timber Bureau)

(Acres Net)(a)

			1968	1969	1970	1971	1972
Government		}	395,215	438,097	483,080	522,304	566,321
-	...						
Exotic conifers -	...		207,176	228,291	248,529	271,435	292,155
Pinus	...						
Radiata	...		602,391	666,388	731,609	793,739	858,476
Other pinus species	...						
Other exotic conifers	...		161,326	187,035	190,986	203,524	223,614
			47,224	52,865	55,964	66,211	74,131
Native conifers			208,550	239,900	246,950	269,735	297,745
Total			810,941	906,288	978,559	1,063,474	1,156,221
Private - Pinus radiata							
Other conifers							
Total							
Grand Total							

(a) Excludes firebreaks and other areas not actually forested.

The above table shows the predominance of Pinus radiata Western Australia. This species is not

climatically adapted to in all States except Queensland and growing in the former State, where the native hoop pine is the most important plantation species, with slash pine (***Pinus elliottii* var. elliottii**) in second place. The main species in Western Australia is maritime pine (***P. pinaster***), which is particularly adapted to growing on sandy soils too poor for the satisfactory growth of other species.

Private plantations have now assumed a position of importance in the softwood economy. The bulk of them comprise relatively large areas belonging to tree-planting or sawmilling companies, or to larger organisations in the pulp and paper industry. The first phase of extensive private planting was in South Australia and Victoria during the decade 1925-35, and these plantations now form the basis of expanding timber-using industries. The second phase began after the 1939-45 War, when the pulp and paper industry commenced planting on a fairly large scale in order to provide part of the raw material for its future requirements. Investment companies and companies engaged in forest products processing have also contributed to production in the private forestry sector.

Types of softwood species used in plantations

Native species. Hoop pine—*Araucaria cunninghamii*. Hoop pine is a high quality softwood. Where it occurs naturally in the rain forests, it attains very large dimensions, reaching 150 feet in height and four feet or more in diameter. To grow hoop pine to this size in plantations would take too long, and a height of 100 feet and diameter of 20 inches is considered satisfactory for utilisation. On good sites this would require a rotation of fifty to sixty years.

All tests to date indicate that the rapid, controlled growth possible in plantations does not affect the quality of the wood in the case of hoop pine; in fact, the wood properties of rapidly grown plantation trees are equal to and sometimes superior to those of average wood from virgin forests. On the evidence available, branch size (with its effect on the knottiness of the timber) appears to be a factor that can be more readily influenced by genetic rather than silvicultural measures. The Forestry Department of Queensland is conducting research on this and other aspects of tree breeding.

The timber of hoop pine is in strong demand for most purposes where durability is not a prime consideration.

Bunya pine - ***Araucaria bidwillii***. This species, which is closely related to hoop pine, is planted to only a limited extent on account of its slow growth. It is more heavily-branched and more difficult to establish than hoop pine.

Exotic species

Radiata pine - ***Pinus radiata***. This pine was first introduced into Australia, as well as into New Zealand and South Africa, about a hundred years ago, and has become one of the most important softwood species. It is a native of the Monterey Peninsula in southern California, where it is of negligible importance. When it was introduced to countries overseas it frequently showed a far superior rate of growth and attained much greater dimensions than in its native habitat, with the result that one of its common names is 'remarkable pine'. Heights at twenty years of age may vary from sixty feet to over a hundred feet, and at maturity attain 130-140 feet. In Australia its planting is mainly restricted to the winter rainfall regions where the summers are dry and warm. Successful plantations have been established in south-eastern South Australia, southern Victoria, Tasmania, on the southern and central tablelands and the south-western foothills of New South Wales, and in the Australian Capital Territory. The mean annual increment of timber per acre varies from about 4.67 to 8.5 cubic metres in the round, true volume. Expressed in terms of a forty-year rotation, an average acre can be expected to produce a total volume of about 283 cubic metres including approximately 259 cubic metres of sawlogs and about 24 cubic metres of

pulpwood or small case logs. The timber, like that of most species, needs to be mature, and requires careful milling and seasoning. Under these conditions it is at least equal in quality to red deal (the timber of **Pinus sylvestris**) which is one of the main building timbers of northern Europe.

Slash pine - **Pinus elliottii var. elliottii**. This species replaces *Pinus radiata* as the main exotic species in Queensland and in coastal New South Wales north of Newcastle, which are areas of summer rainfall. Slash pine is one of the main timber species of the southern States of the United States of America, and in that country it is used extensively for pulp, sawn timber and veneers. Thinnings from plantations in Queensland have yielded sawn timber of good quality and there is no reason to expect that the quality will be in any way inferior to that of timber in its natural habitat. The rotation will probably be much the same as for *P. radiata* - about forty years. Slash pine was first introduced into Queensland in 1925 and after 1930 began to play an important part in the planting program of the State.

Loblolly pine - **Pinus taeda**. This is another species from the southern and eastern parts of the United States of America, where it grows on a wide variety of soils and under a similar range of climatic conditions to slash pine. It is not generally quite as uniformly healthy and vigorous as slash pine, and for this reason has not been planted as extensively, though, if certain aspects of development can be controlled, it is likely to receive increased attention.

Maritime pine - **Pinus pinaster**. This is the most important exotic pine in Western Australia, where it grows on sandy soils which are too poor for satisfactory development of *P. radiata*. It is also used in similar areas in South Australia. Maritime pine is a native of the Mediterranean region and very large areas of it have been planted for sand dune control in Les Landes region of France.

Maritime pine does not attain a height comparable with *P. radiata*, eighty to ninety feet being common for well-grown mature trees, but diameters are relatively large. The timber is useful for a wide range of purposes.

Pinus caribea var. hondurensis. Caribbean pine is fast growing and of excellent form. Presently it is being planted in frost-free areas north of Brisbane where it could replace slash pine as the major exotic conifer in coastal areas.

Callitris intratropica. This tree is a member of the cypress family. It is one of the few species of tree which is resistant to the termites of the Northern Territory. *Callitris intratropica* is presently being planted at the rate of one thousand acres per year in the Northern Territory.

Other species

Interest in the past has been shown in Douglas fir (**Pseudotsuga, menziesii**) in high rainfall areas of Victoria and southern New South Wales and limited areas of this species have been established. Canary Island pine (**P. Canariensis**) has been tried under conditions too hot and dry for most other exotic conifers. However, major developments in the future are likely to be in tree improvement within the major species rather than the introduction of new species or artificial hybrids.

The first seed orchard in Australia was planted in Queensland in 1953. The Australian forest services now have 1,200 acres of seed orchards available to them. Through controlled breeding programs, tree improvement can be made with respect to form, disease and drought resistance. Australia can expect to be self-sufficient in seed requirements for all major species by 1980.

Forest administration and research

Commonwealth Forestry and Timber Bureau. The functions of the Commonwealth Forestry

and Timber Bureau are laid down in the **Forestry and Timber Bureau Act 1930-1953** and include forestry research and education, the study of timber supply, and advice to the Government on forestry matters. The administering department is the Department of Primary Industry.

In 1961 the Commonwealth Government expanded its activities in forestry research in Australia. The existing Forestry and Timber Bureau Divisions of Silvicultural Research and Forest Management Research were combined to form the Forest Research Institute as a separate branch of the Bureau. The purpose of the Institute is to provide complete coverage in forestry research, ensuring that all problems of primary importance to the practice and development of forestry in Australia are investigated. In developing a program with this objective, the Institute takes account of the search activities and potential of the State forest services and other organisations. The research work carried out by the existing sections of the Forest Research Institute covers a wide range of studies, including the following: factors affecting tree growth, tree breeding, introduction of exotic species, forest nutrition, forest botany, forest entomology and pathology, fire protection, watershed management, forest mensuration, forest management and management economics, aerial inventory, biometrics. and tree seed. The Forest Research Institute maintains six regional establishments in the Commonwealth, two of which have an outstation in addition to the regional headquarters. These research stations are run on a co-operative basis with State forest services and private forest companies or other government instrumentalities.

The Forestry and Timber Bureau also maintains a Forest Resources Development Branch concerned with the compilation and analysis of statistics of production, consumption and trade in timber and other forest products. This Branch also carries out studies in forest economics and research into logging methods and machines. Advice on timber supply matters is currently made available to government departments and private enterprise. Research is also undertaken on matters associated with the marketing of timber products.

Commonwealth Scientific and Industrial Research Organisation. The Divisions of Building Research and Applied Chemistry carry out a wide range of investigations relating to the properties of wood and the uses of wood and wood products. These activities were formerly carried out by the Division of Forest Products which, in May 1971, ceased to be a separate entity within C.S.I.R.O. following a reorganisation of C.S.I.R.O. research effort in the field of forest products. That part of the Division of Forest Products concerned with wood as a structural material was integrated with the Division of Building Research, and the remaining part, which was concerned with research for the paper and pulp industry, was integrated with the Division of Applied Chemistry. Most of the present forest products activities of both Divisions are conducted at premises in South Melbourne now known as the C.S.I.R.O. Forest Products Laboratory.

At the Forest Products Laboratory research work administered by the Division of Building Research is carried out by six separate Sections: Timber Physics, Timber Structures, Timber Engineering Science, Forest Conversion Engineering and Forest Conversion Science. In addition, the Division provides assistance to individuals and industry, administers courses of instruction on timber properties and usage, and maintains co-operative projects with overseas authorities operating in the same fields. The research sections working at the Laboratory as units of the Division of Applied Chemistry are Paper Science, and Wood and Forest Science.

Forestry in the Territories. Forestry activities in Papua New Guinea are controlled by the Administration through its Department of Forests. The management of forests in the Australian Capital Territory is the responsibility of the Forestry Branch of the Department of the Capital Territory.

This page last updated 23 November 2012

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